UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

STEPHEN McCOLLUM, and SANDRA McCOLLUM, individually, and STEPHANIE KINGREY, individually and as independent administrator of the Estate of LARRY GENE McCOLLUM, PLAINTIFFS	§	
v.	§	CIVIL ACTION NO. 4:14-cv-3253 JURY DEMAND
BRAD LIVINGSTON, JEFF PRINGLE, RICHARD CLARK, KAREN TATE, SANDREA SANDERS, ROBERT EASON, the UNIVERSITY OF TEXAS MEDICAL BRANCH and the TEXAS DEPARTMENT OF CRIMINAL JUSTICE. DEFENDANTS	§	

Plaintiffs' Consolidated Summary Judgment Response Appendix

EXHIBIT 122

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 62 / No. 31
August 9, 2013

Heat Illness and Deaths — New York City, 2000–2011

Heat waves kill more persons, on average, than any other extreme weather event in the United States (*1*), and additional heat-related deaths are caused by hot weather not classified as heat waves (*2*). Summer temperatures in New York City (NYC) are increasing, with longer and hotter heat waves projected into the next century and beyond (*3*). To assess current risk factors and vulnerable populations among NYC residents, hospital data, death certificate data, and medical examiner records involving cases of heat illness, including hyperthermia (also known as heat stroke), were analyzed by the NYC Department of Health and Mental Hygiene for the period 2000–2011. On average, 447 patients each year were treated for heat illness and released from emergency departments, 152 were hospitalized, and 13 persons died from heat stroke. Chronic diseases, mental health disorders, and obesity were common comorbidities. Among fatality investigation records with information available about cooling, none found a working air conditioner in use. Outreach to city residents at high risk and their caregivers should emphasize the dangers of heat and importance of protective cooling measures during hot weather. Improving awareness of chronic health conditions that increase vulnerability to heat is also important.

The New York Statewide Planning and Research Cooperative System (SPARCS) provided de-identified electronic patient records from NYC emergency departments (EDs) and hospitals from 2000 through 2010.* Records were limited to NYC residents and homeless persons with any diagnosis of heat illness from *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes 992.0–992.9, "effects of heat and light,"† or External Cause of Injury (E-code) of E900.0, "excessive heat due to weather conditions." Records with an E-code of E900.1 (i.e., "due to man-made conditions"), and records of patients whose disposition was "death" (n = 75) were excluded. De-identified electronic death certificate data were obtained from the NYC Department of Health and Mental Hygiene Office of Vital Statistics for the years 2000–2011 for NYC residents and homeless persons. Hyperthermia deaths were defined as cases having *International Classification of Diseases, 10th Revision,* (ICD-10) codes X30, "exposure to excessive natural heat" or T67, "heatstroke and sunstroke" listed as causes of death anywhere in the record, for deaths occurring in the months of May–September. Records having a man-made cause of heat exposure (W92) were excluded.

Counts and rates of heat illness ED visits, admissions, and deaths were summarized by age, sex, neighborhood poverty, and place of illness onset (Table 1). Average annual rates were estimated using 2005 population estimates produced by the NYC Department of Health and Mental Hygiene based on the U.S. Census Bureau Estimate Program and housing data from the NYC Department of City Planning. Neighborhood poverty was classified as the percentage of individuals, by postal code, below 100% of the federal poverty level, according to the U.S. Census American Community Survey 2007–2011.

A protocol was established after 2006 whereby the Department of Health hyperthermia investigation team is notified by the Office of the Chief Medical Examiner and the Office of Vital Statistics of deaths involving hyperthermia

* Complete emergency department records became available in 2005.
† Includes heat stroke, sunstroke, heat syncope, heat cramps, heat exhaustion, heat fatigue, and heat edema.

Continuing Education examination available at http://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

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U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

TABLE 2. Number and percentage of heat stroke decedents (n = 48), by selected medical characteristics — New York City, 2008–2011

Medical characteristic	Heat stroke decedents		
	No.	(%)	(95% CI)
Evidence of cardiovascular disease	36	(75)	(60–86)
Evidence of alcohol or substance abuse	14	(29)	(17–44)
History of diabetes	7	(15)	(6–28)
History of schizophrenia/ schizo-affective disorder	5	(10)	(3–23)
Cerebral palsy	3	(6)	(1–17)
Known body mass index among those aged 18–64 yrs (n = 21)			
Normal/Underweight	5	(24)	(8–47)
Overweight	6	(29)	(11–52)
Obese	10	(48)	(26–70)

Abbreviation: CI = confidence interval.

Reported by

Katherine Wheeler, MPH, Kathryn Lane, MPH, Sarah Walters, MPH, Thomas Matte, MD, New York City Dept of Health and Mental Hygiene. ***Corresponding contributor:*** *Kathryn Lane, klane1@health.nyc.gov, 646-632-6533.*

Editorial Note

During 2000–2011, approximately 600 cases of serious illness and 13 deaths occurred annually in NYC as a result of heat illness. Although these cases do not capture the full spectrum of the health effects of extreme heat, such as exacerbations of chronic conditions leading to hospital admissions or deaths that are not recognized or coded as heat-related (*9*), cases of hyperthermia and other forms of heat illness can be directly identified, counted, and investigated to better understand risk factors and potential gaps in public health communications and interventions.

Older adults continue to have the highest rates of heat illness and death. However, persons of all ages are at risk, especially those with underlying physical or mental health conditions and those taking medications that can impair thermoregulation (*4*). The association of obesity with heat-related death in NYC is consistent with biologic evidence that adiposity increases vulnerability to heat exhaustion (*4,5*).

In NYC, the majority of hospitalized and fatal cases of heat illness occurred in the home. Among the 26 deaths reviewed that had information about the presence of home air conditioning, none of the decedents had a working air conditioner. Aspects of the urban environment can cause city apartments without air conditioning, in some cases, to reach temperatures more than 18°F (10°C) higher than outdoor temperatures on hot days (*6*).

Unlike findings from a study of a 1995 Chicago heat wave (*7*), NYC hyperthermia decedents were not statistically more likely to live in multifamily apartment buildings than the general city population. Also, unlike other previous studies (*4*), NYC hyperthermia decedents were not more likely to live alone. Hyperthermia can progress rapidly, and many persons might not be aware of the warning signs, including lack of sweating in late-stage illness.

The findings in this report are subject to at least three limitations. First, cases of heat illness identified in this report might not include heat-associated increases in rates of hospital care for other conditions such as cardiovascular disease, renal disease, and diabetes, and do not reflect heat-associated increases in overall mortality rates from natural causes (*4,8*). In 2006, 100 excess deaths from natural causes in NYC were attributed to a severe heat wave, based on typical summer mortality rates from a statistical model (*9*). Second, place of injury is not determined by a standard protocol and often is recorded as unspecified or unknown. Similarly, data on air conditioning was available only for a small number of decedents. Finally, the prevalence of obesity in the general NYC population was based on self-reported height and weight, which tends to underestimate obesity.

Although heat waves typically cause less mortality today, compared with years past (*10*), reductions in summer heat

What is already known on this topic?

Heat waves cause more deaths in the United States, on average, than any other type of extreme weather event. Older adults, those with underlying physical or mental health conditions, and those without access to working home air conditioning are most at risk for hyperthermia death.

What is added by this report?

During 2000–2011, approximately 447 heat-related emergency department visits, 152 hospital admissions, and 13 heat-related deaths occurred each year in New York City. Higher rates of heat illness and death were associated with older age and neighborhood poverty; chronic physical and mental health conditions were prevalent comorbidities in decedents. Based on medical examiner records for 48 decedents, 85% were exposed at home and, among records with information regarding the presence of air conditioning, none of the decedents had a working air conditioner. Among decedents aged 18–64 years, 48% were obese and another 29% were overweight. Unlike in some previous studies, decedents in this analysis were not more likely to live in multifamily apartment buildings or to live alone.

What are the implications for public health practice?

Rising summer temperatures from climate change, a growing older adult population, and the increasing prevalence of obesity and chronic disease might increase the number of serious heat illnesses and deaths in New York City. Adaptation efforts in urban settings should focus on neighborhoods with high poverty, promoting greater access to air conditioning, and encouraging members of the public to check on vulnerable family members and contacts.

TABLE 3. Number and percentage of heat stroke decedents with onset at home (n = 41), by selected housing characteristics,* compared with percentage of city residents overall — New York City, 2008–2011

	Heat stroke decedents			Residents overall		
Housing characteristic	No.	(%)	(95% CI)	(%)	(95% CI)	p-value
Air conditioner in the home						
Present, working, and in use†	0	—	—	(87)	(87–88)	
Not working or not in use	3	(12)	(3–30)			
No	23	(88)	(70–98)	(13)	(12–13)	<0.001
Unknown§	15	—	—			
Lived alone						
Yes	7	(18)	(6–31)	(14)	(14–14)	
No	31	(82)	(66–92)	(86)	(86–86)	0.432
Unknown§	3	—	—			
Building type						
1 or 2 units	14	(36)	(21–53)	(33)	(33–34)	
≥3 units, walk-up	16	(41)	(26–58)	(32)	(31–33)	
≥3 units, elevator	9	(23)	(11–39)	(35)	(34–36)	0.262
Unknown§	2	—	—			
No. of floors						
≤2	16	(39)	(24–56)	(30)	(29–31)	
3–5	12	(29)	(16–46)	(35)	(34–36)	
≥6	13	(32)	(18–48)	(36)	(35–36)	0.395
Public housing						
Yes	1	(2)	(1–13)	(6)	(6–6)	
No	40	(98)	(87–99)	(94)	(94–95)	0.337

Abbreviation: CI = confidence interval.

* Comparison with percentage of New York City residents overall is from the 2010 U.S. Census for householders living alone; household occupancy type and structure type is from the 2008 New York City Housing and Vacancy Survey. Comparison with citywide air conditioning prevalence is from the 2007 New York City Community Health Survey for residents living in households with or without air conditioning. Additional information available at http://www.nyc.gov/html/goh/html/data/survey.shtml.

† Percentages for residents overall include all homes with air conditioners, whether working or not.

§ Excluded from the denominator.

illness and mortality over the past century in NYC might be threatened by rising temperatures, a growing older adult population, and the increasing prevalence of obesity and chronic disease. This investigation highlights risks to vulnerable persons living in NYC homes without air conditioning. Before and during heat waves, outreach to seniors and those with chronic physical and mental health conditions, as well as their caregivers, should emphasize protective measures to avoid heat illness. Susceptible persons should be encouraged to stay hydrated and use air conditioning, if available, during periods of extreme heat. For those without air conditioning who are able to leave their homes, cooling centers and other air-conditioned public places can provide respite during heat waves. Pools, cool showers, or baths also can provide some relief. Surveillance for hyperthermia illness and mortality can help identify local patterns of vulnerability to best target heat emergency response activities and prevention efforts.

Acknowledgments

Kristina Metzger PhD, Nathan Graber MD, Mukarram Razvi, NYC Dept of Mental Health and Hygiene, Bureau of Vital Statistics, NYC Office of the Chief Medical Examiner.

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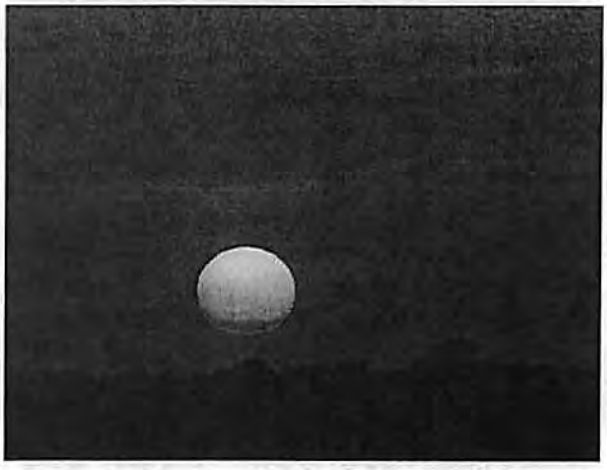
Plaintiffs' Consolidated Summary Judgment Response Appendix

EXHIBIT 123

Heat: *A Major Killer*

Espanol

Heat is one of the leading weather-related killer in the United States, resulting in hundreds of fatalities each year. In the disastrous heat wave of 1980, more than 1,250 people died. In the heat wave of 1995 more than 700 deaths in the Chicago area were attributed to heat, making this the deadliest weather event in Chicago history. In August 2003, a record heat wave in Europe claimed an estimated 50,000 lives.



North American summers are hot; most summers see heat waves in one or more parts of the United States. East of the Rockies, they tend to combine both high temperatures and high humidity, although some of the worst heat waves have been catastrophically dry.

NOAA's Watch, Warning, and Advisory Products for Extreme Heat

Each National Weather Service Forecast Office issues the following heat-related products as conditions warrant:

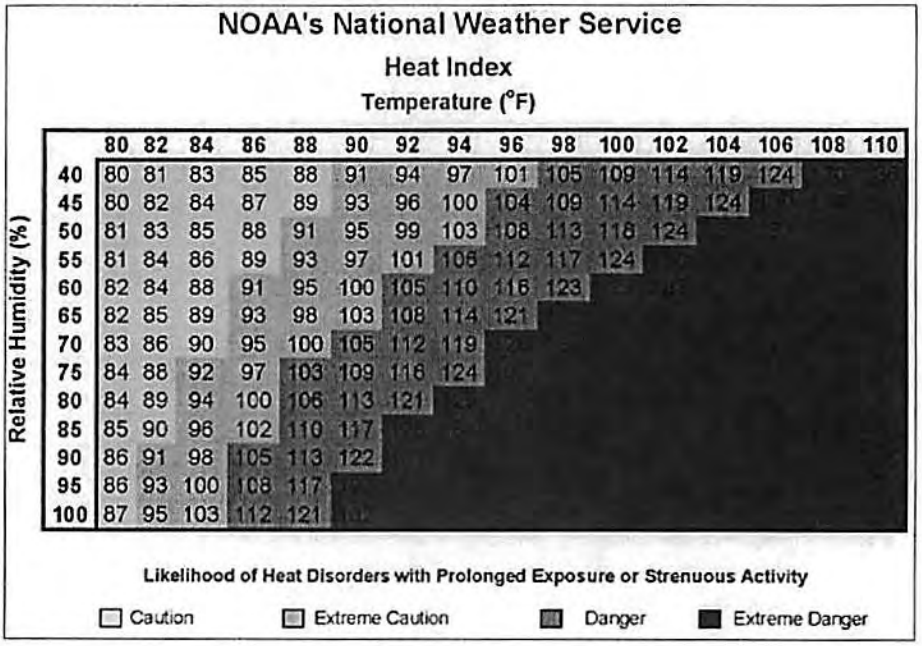
- **Excessive Heat Outlooks:** : are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead time to prepare for the event, such as public utility staff, emergency managers and public health officials. See the mean heat index and probability forecasts maps.
- **Excessive Heat Watches:** are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain. A Watch provides enough lead time so that those who need to prepare can do so, such as cities officials who have excessive heat event mitigation plans.
- **Excessive Heat Warning/Advisories** are issued when an excessive heat event is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurring. The warning is used for conditions posing a threat to life. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life.

How Forecasters Decide Whether to Issue Excessive Heat Products

How Forecasters Decide Whether to Issue Excessive Heat Products
NOAA's heat alert procedures are based mainly on Heat Index Values. The Heat Index, sometimes referred to as the apparent temperature is given in degrees Fahrenheit. The Heat Index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature.

To find the Heat Index temperature, look at the Heat Index chart below. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index--how hot it feels--is 121°F. The National Weather Service will initiate

alert procedures when the Heat Index is expected to exceed 105°-110°F (depending on local climate) for at least 2 consecutive days. Nws also offers a Heat Index chart for area with high heat but low relative humidity.



IMPORTANT: Since heat index values were devised for shady, light wind conditions, **exposure to full sunshine can increase heat index values by up to 15°F.** Also, **strong winds**, particularly with very hot, dry air, can be extremely hazardous.

The Heat Index Chart shaded zone above 105°F (orange or red) shows a level that may cause increasingly severe heat disorders with continued exposure or physical activity.

The Hazards of Excessive Heat

During extremely hot and humid weather the body's ability to cool itself is affected. When the body heats too rapidly to cool itself properly, or when too much fluid or salt is lost through dehydration or sweating, body temperature rises and heat-related illnesses may develop.

Heat-related illnesses can range from heat cramps to heat exhaustion to more serious heat stroke. Heat stroke can result in death and requires **immediate medical attention.**

Factors or conditions that can make some people more susceptible to heat-related illnesses include age (older adults and young children), obesity, fever, heart disease, mental illness, poor circulation, prescription drug and alcohol use, and sunburn. Sunburn, caused by ultraviolet radiation from the sun, can significantly retard the skin's ability to shed excess heat.

Heat-Related Illness Symptoms and First Aid

HEAT CRAMPS

- **Symptoms:**
  - Painful muscle cramps and spasms usually in legs and abdomen
  - Heavy sweating
- **First Aid:**
  - Apply firm pressure on cramping muscles or gentle massage to relieve spasm.
  - Give sips of water, if nausea occurs, discontinue water

HEAT EXHAUSTION

- **Symptoms:**
  - Heavy sweating
  - Weakness
  - Cool, pale, clammy skin
  - Weak pulse
  - Possible muscle cramps
  - Dizziness

- Nausea and vomiting
- Fainting
- Normal temperature possible

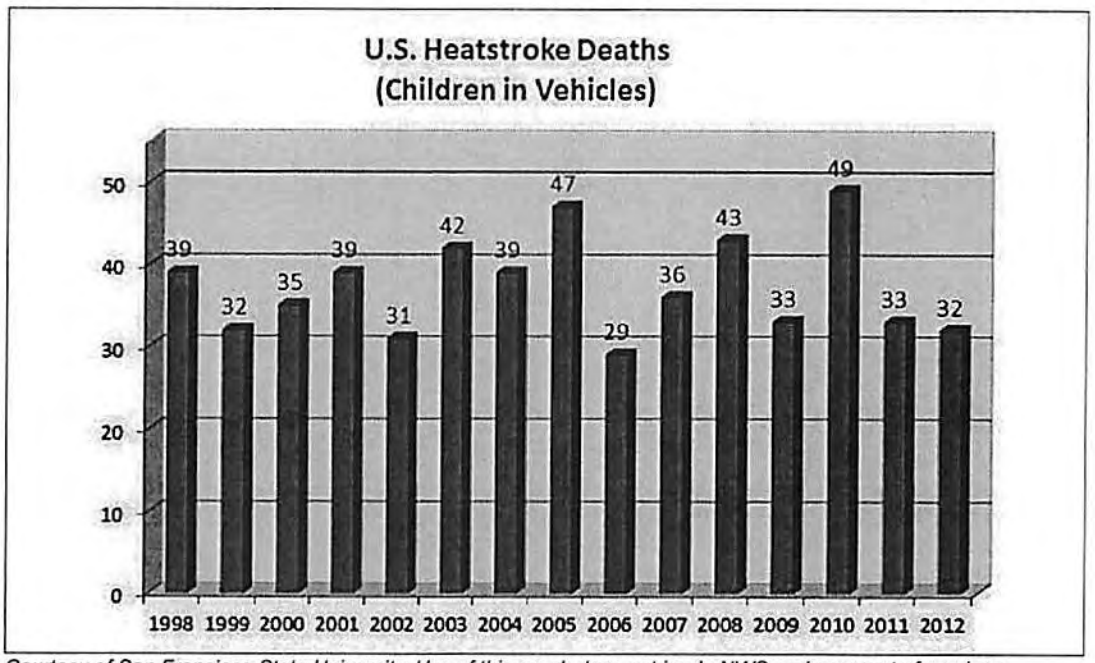
- **First Aid:**
  - Move person to a cooler environment
  - Remove or loosen clothing
  - Apply cool, wet cloths
  - Fan or move victim to air conditioned room
  - Offer sips of water. If nausea occurs, discontinue water. If vomiting continues, seek immediate medical attention.

HEAT STROKE (or sunstroke)

- **Symptoms:**
  - Altered mental state
  - Possible throbbing headache, confusion, nausea, dizziness, shallow breathing
  - High body temperature (106°F or higher)
  - Skin may be hot and dry, or patient may be sweating
  - Rapid pulse
  - Possible unconsciousness
- **First Aid:**
  - **Heat stroke is a severe medical emergency. Summon emergency medical assistance or get the victim to a hospital immediately. Delay can be fatal.**
  - Move the victim to a cooler, preferably air-conditioned, environment
  - Reduce body temperature with a water mister and fan or sponging
  - Use fan if heat index temperatures are below the high 90s
  - Use extreme caution
  - If temperature rises again, repeat process
  - Do NOT give fluids

Never Leave Children, Disabled Adults or Pets in Parked Vehicles

Each year, dozens of children and untold numbers of pets left in parked vehicles die from hyperthermia. Hyperthermia is an acute condition that occurs when the body absorbs more heat than it can handle. Hyperthermia can occur even on a mild day. Studies have shown that the temperature inside a parked vehicle can rapidly rise to a dangerous level for children, pets and even adults. Leaving the windows slightly open does not significantly decrease the heating rate. The effects can be more severe on children because their bodies warm at a faster rate than adults.



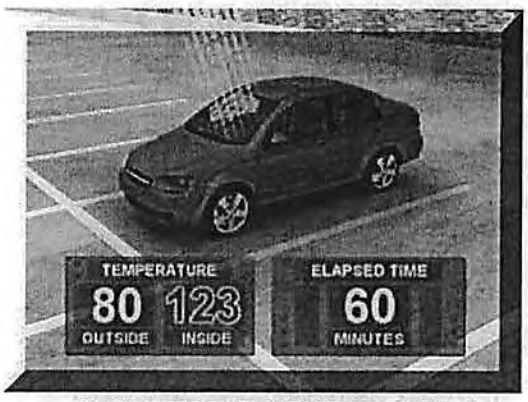
Courtesy of San Francisco State University. Use of this graph does not imply NWS endorsement of services provided by San Francisco State University.

How Fast Can the Sun Heat a Car?

The sun's shortwave radiation (yellow in figure below) heats objects that it strikes. For example, a dark dashboard or seat can easily reach temperatures in the range of 180 to over 200°F. These objects (e.g., dashboard, steering wheel, child seat) heat the adjacent air by conduction and convection and also give off longwave radiation (red in figure below) which is very efficient at warming the air trapped inside a vehicle.

Shown below are time lapse photos of thermometer readings in a car over a period of less than an hour. As the animation shows, in just over 2 minutes the car went from a safe temperature to an unsafe temperature of 94.3°F. This demonstration shows just how quickly a vehicle can become a death trap for a child.

Objects Heated by the Sun Warm Vehicle's Air



CLICK HERE FOR ANIMATION (700K)
(Hi-Res ~ 2.5 mb.WMV file)
Individual Frames:
0 min, 10 min, 20 min, 30 min, 40 min, 50 min, 60 min
Animation Courtesy of General Motors and San Francisco State University. Use of this animation does not imply NWS endorsement of services provided by General Motors and San Francisco State University.
Hyperthermia deaths aren't confined to summer months. They also happen during the spring and fall. Below are some examples.

The atmosphere and the windows of a car are relatively transparent to the sun's shortwave radiation yellow in figure below) and are warmed little. This shortwave energy, however, does heat objects it strikes. For example, a dark dashboard or seat can easily reach temperatures in the range of 180°F to more than 200°F. These objects, e.g., dashboard, steering wheel, childseat, heat the adjacent air by conduction and convection and give off longwave radiation (infrared), which efficiently warms the air trapped inside a vehicle. Learn more about excessive heat and cars.

Vehicle Related Heat Deaths

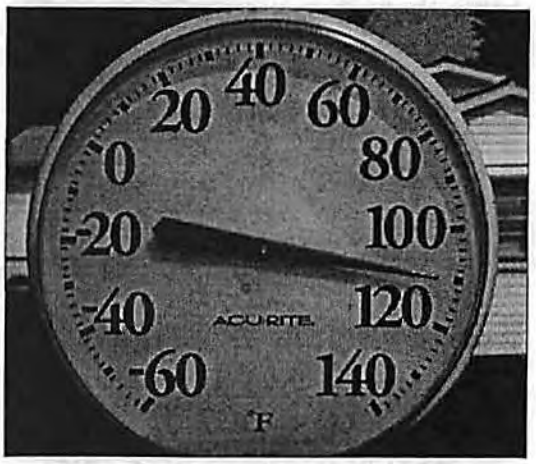
- **Honolulu, HI, March 07, 2007:** A 3-year-old girl died when the father left her in a child seat for 1.5 hours while he visited friends in a Waikiki apartment building. The outside temperature was only **81 degrees**.
- **North Augusta, SC, April 2006:** A mother left her a 15-month-old son in a car. He was in a car for 9 hours while his mom went to work. She is now serving a 20-year prison sentence.
- **Greenville, TX, December 01, 2012**: A 6-month-old boy died after being left in a car for more than 2 hours by his mother. She was charged with murder. The temperature rose to an **unseasonably warm 81 degrees** on that day.
- **Adults are in danger too.** On July 12, 2001, a man died of heat stroke after falling asleep in his car with the windows rolled up in the parking lot of a supermarket in Hinds County, MS.

Safety Tips for Concerning Children

- **Make sure your child's safety seat and safety belt buckles aren't too hot** before securing your child in a safety restraint system, especially when your car has been parked in the heat.
- **Never leave your child** unattended in a vehicle, even with the windows down.
- **Teach children not to play** in, on, or around cars.
- **Always lock car** doors and trunks--even at home--and keep keys out of children's reach.
- **Always make sure all children have left the car** when you reach your destination. Don't leave sleeping infants in the car ever

Downloadable Child Vehicular Heat Stroke Prevention Logos

Safety Tips for Adults



- **Slow down.** Reduce, eliminate or reschedule strenuous activities until the coolest time of the day. Children, seniors and anyone with health problems should stay in the coolest available place, not necessarily indoors.
- **Dress for summer.** Wear lightweight, light-colored clothing to reflect heat and sunlight.
- **Put less fuel on your inner fires.** Foods, like meat and other proteins that increase metabolic heat production also increase water loss.
- **Drink plenty of water, non-alcoholic and decaffeinated fluids.** Your body needs water to keep cool. Drink plenty of fluids even if you don't feel thirsty. Persons who have epilepsy or heart, kidney or liver disease, are on fluid restrictive diets or have a problem with fluid retention should consult a physician before increasing their consumption of fluids. **Do not drink alcoholic beverages and limit caffeinated beverages.**
- **During excessive heat periods, spend more time in air-conditioned places.** Air conditioning in homes and other buildings markedly reduces danger from the heat. If you cannot afford an air conditioner, go to a library, store or other location with air conditioning for part of the day.
- **Don't get too much sun.** Sunburn reduces your body's ability to dissipate heat.
- **Do not take salt tablets unless specified by a physician.**

Preparing for and Responding to Excessive Heat Events

The Excessive Heat Events Guidebook was developed by the Environmental Protection Agency (EPA) in 2006, in collaboration with the National Weather Service, the Centers for Disease Control and Prevention, and the Department of Homeland Security. This guidebook provides best practices for saving lives during heat waves in urban areas, and provides a menu of options that communities can use in developing their own mitigation plans.

Resources:

- Safety and Health Topics from the Occupational Safety & Health Administration (OSHA)
- Centers for Disease Control and Prevention (CDC)
- American Red Cross
- Federal Emergency Management Agency (FEMA)

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NOAA, National Weather Service
Office of Climate, Water, and Weather Services
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Questions? Comments?

http://www.nws.noaa.gov/os/heat/index.shtml
Last Updated: July 18, 2013

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Heatstroke

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Updated: Oct 16, 2012

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Pathophysiology

Despite wide variations in ambient temperatures, humans and other mammals can maintain a constant body temperature by balancing heat gain with heat loss. When heat gain overwhelms the body's mechanisms of heat loss, the body temperature rises, and a major heat illness ensues. Excessive heat denatures proteins, destabilizes phospholipids and lipoproteins, and liquefies membrane lipids, leading to cardiovascular collapse, multiorgan failure, and, ultimately, death. The exact temperature at which cardiovascular collapse occurs varies among individuals because coexisting disease, drugs, and other factors may contribute to or delay organ dysfunction. Full recovery has been observed in patients with temperatures as high as 46°C, and death has occurred in patients with much lower temperatures. Temperatures exceeding 106°F or 41.1°C generally are catastrophic and require immediate aggressive therapy.

Heat may be acquired by a number of different mechanisms. At rest, basal metabolic processes produce approximately 100 kcal of heat per hour or 1 kcal/kg/h. These reactions can raise the body temperature by 1.1°C/h if the heat dissipating mechanisms are nonfunctional. Strenuous physical activity can increase heat production more than 10-fold to levels exceeding 1000 kcal/h. Similarly, fever, shivering, tremors, convulsions, thyrotoxicosis, sepsis, sympathomimetic drugs, and many other conditions can increase heat production, thereby increasing body temperature.

The body also can acquire heat from the environment through some of the same mechanisms involved in heat dissipation, including conduction, convection, and radiation. These mechanisms occur at the level of the skin and require a properly functioning skin surface, sweat glands, and autonomic nervous system, but they also may be manipulated by behavioral responses. Conduction refers to the transfer of heat between 2 surfaces with differing temperatures that are in direct contact. Convection refers to the transfer of heat between the body's surface and a gas or fluid with a differing temperature. Radiation refers to the transfer of heat in the form of electromagnetic waves between the body and its surroundings. The efficacy of radiation as a means of heat transfer depends on the angle of the sun, the season, and the presence of clouds, among other factors. For example, during summer, lying down in the sun can result in a heat gain of up to 150 kcal/h.

Under normal physiologic conditions, heat gain is counteracted by a commensurate heat loss. This is orchestrated by the hypothalamus, which functions as a thermostat, guiding the body through mechanisms of heat production or heat dissipation, thereby maintaining the body temperature at a constant physiologic range. In a simplified model, thermosensors located in the skin, muscles, and spinal cord send information regarding the core body temperature to the anterior hypothalamus, where the information is processed and appropriate physiologic and behavioral responses are generated. Physiologic responses to heat include an increase in the blood flow to the skin (as much as 8 L/min), which is the major heat-dissipating organ; dilatation of the peripheral venous system; and stimulation of the eccrine sweat glands to produce more sweat.

As the major heat-dissipating organ, the skin can transfer heat to the environment through conduction, convection, radiation, and evaporation. Radiation is the most important mechanism of heat transfer at rest in temperate climates, accounting for 65% of heat dissipation, and it can be modulated by clothing. At high ambient temperatures, conduction becomes the least important of the 4 mechanisms, while evaporation, which refers to the conversion of a liquid to a gaseous phase, becomes the most effective mechanism of heat loss.